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A LECTURE
ON
SCIENCE & REVELATION

JAMES STUART

198.g.
68.

A LECTURE

ON

SCIENCE AND REVELATION

DELIVERED IN THE ROOMS OF

The Royal Institution, Liverpool, and the Philosophical Society, Leeds,
in concluding a Course of Lectures on Meteorology for the
North of England Council for the Education of Women.

BY

JAMES STUART, M.A.

FELLOW AND ASSISTANT TUTOR OF TRINITY COLLEGE, CAMBRIDGE.

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PREFACE

TO

THE SECOND EDITION.

THE COPIES of the following Lecture, which was printed under the circumstances indicated in the Preface to the First Edition, having become exhausted, it is now reprinted with the addition of one or two paragraphs.

TRINITY COLLEGE:
May 1872.

PREFACE

TO

THE FIRST EDITION.

THE SET of Lectures to which reference is made in the opening paragraph of the following pages consisted of a series of Educational Lectures on Meteorology, delivered by me for the North of England Council for the Education of Women, in connection with the Ladies' Educational Associations of Leeds and Liverpool. The course was attended by between 250 and 300 ladies in these two towns, and from the majority of these I received written answers to the questions set weekly on the subject of the Lectures.

The following Lecture, which formed the conclusion of the strictly scientific series which preceded it, has been printed at the request and for the use of some of those who attended the course.

JAMES STUART.

TRINITY COLLEGE, CAMBRIDGE
December 1871.

LECTURE.

I DESIRE in this lecture to take up a somewhat larger and more general question than those which I have been hitherto considering, and to deal, although to some extent it must be very insufficiently, with some portions of the general effect of science on the human mind. In such a set of lectures as the present, this is especially the more desirable, inasmuch as many of you here have been introduced for the first time to the study of science properly so called. It is usual in introducing persons to any study to begin by giving some sort of *resumé* of the leading points in which that study is connected, not only with the special things with which it has to deal, but with the other and various branches of human knowledge or speculation. Following this time-honoured custom I might have begun my set of lectures by one of that introductory nature, but I have rather postponed it to the end, because I believe that mere general conclusions and abstract reasonings are apt to come with but little weight, and the general principles of science and its bearings on other things may be best understood when we have acquired some familiarity with the methods according to which science proceeds.

In the syllabus which I issued before the beginning of these lectures I especially mentioned this as one of the subjects to which I should call your attention, and I did so inasmuch as the subject of meteorology exhibits science in a very important point in which it influences the human mind. The general progress of science has been to introduce law and order into ideas in which they at first did not seem to prevail; and perhaps its most fundamental effect on the human mind has been to encourage the idea of law and order, although, in some respects, it has encouraged it erroneously—or, I should rather say, has encouraged an erroneous idea of what law and order mean. In the matter of meteorology science perhaps aims as high as in any other instance, and encourages this idea of the prevalence of law and order in regions where it is of all least visible. That human beings should dare to approach the phenomena of the winds and thunder with a consciousness that the want of perception of the law which prevails in them is due only to their want of capacity, and not to any real absence of law, is a great proof of the strong hold which this idea has now taken on the human mind. Nor can it be said to be of little importance, inasmuch as, on the one hand, an erroneous view of what is meant by law has been made the foundation of a most oppressive fatalism, while, on the other hand, the arguments drawn from its application have been used to prove the benevolence and wisdom of the Divinity. And, of all the questions in which science affects the human mind, the most important consists in its bearing on the deeper questions of religious faith, which all of us feel to be so nearly allied to each of us.

I am not one of those who believe that the truths of religion can be demonstrated from any investigation of nature. I can see no process of natural philosophy which is capable of demonstrating the goodness, justice, or mercy of God, or the truth of a future life—*all of which form* the necessary groundwork of any religious faith. If this be so, far less can I find from the teaching of nature any proof of those truths more essentially Christian.

All demonstrations, then, of the truths of religion, and of those great moral and spiritual truths which so nearly concern us all—all such demonstrations founded upon what is called naturally theology—seem to me to be vain and useless, if they are to be viewed at all in the light of demonstrations. Revelation is, I believe, as necessary to convince us of God's goodness as it is to convince us of His scheme of redemption through Christ. I am aware, when I speak thus, that I speak in opposition to many popular authors of recent times. Lord Brougham, for instance, in his edition of 'Paley's Natural Theology,' puts especial weight not only on the desirability, but on the necessity of such demonstrations.

Yet the weight of authority in any human matter can never be a reason for our accepting what may otherwise appear to be untrue. Truth is older than the views of any one concerning it; and if we adopt truth in contradiction to the views of our predecessors, we but go there, where these predecessors themselves should have gone.

Certainly, arguments from nature may be, and are, of great use to those who already believe in God and in His goodness, as we shall attempt to see; but reason and experience alike tell us that for the conversion of the unbelieving such arguments are unavailing. Nay, indeed, the whole Bible points to us that it is so. It is said, 'The world by wisdom knew not God.' The knowledge of God is not a matter of demonstration from external observation, but comes through the heart. It is by the sense of faith, not that of sight, that God is apprehended. And since every man's reasoning is the same, and will from the same premises lead necessarily to the same conclusion, it follows that if the truths of God were to be demonstrated from nature, there would be no need of a revelation. 'Those who seek after God,' says the Bible, 'shall find Him;' but if He were to be found in the motions of the planets, it would not be a matter of individual search. When once demonstrated by some Newton it would necessarily be admitted by all. But we are told, 'None cometh unto the Father but by Me.' If, then, we could demonstrate from nature the existence and attributes of God, that statement would not be true. What the Scriptures teach us is this—that our God is a God who hides Himself; that, since his nature became corrupted, man has been left in a state of blindness, from which he can only be extricated by Christ; and that the search after God is a matter to be begun afresh by each individual, is not a matter of the progress of the species, and in this differs radically from the progress of any science in which others labour and we enter into the fruits of their labours.

And it is well worthy of remark that the Scriptures themselves do not attempt from external nature to demonstrate the existence of God. What they assert about Him they assert dogmatically. God, when He declares Himself, declares Himself as the God of Abraham, of Isaac, and of Jacob. His relationship to human beings is a personal, individual relationship. When Elijah fled to the mountain of God, the thunder and the wind did not teach him of God, but the still, small voice within his own heart. I know that it is said that the Heavens declare the glory of God, and the firmament sheweth His handwork; and that there is no voice nor tongue in which they do not bear that witness. But though their voice be not silent in any language, yet men's ears are deaf to them; as the apostle Paul himself *signifies, where he* shows in the beginning of the epistle to the Romans, that sin and neglect have made these witnesses unavailing. While, then, he reproaches men with not having seen in nature what an enlightened conscience might have displayed to them, he proceeds to enlighten that conscience, not by an appeal to nature, nor by any argument based on natural theology, but by awakening the individual sense of sin and the individual need of a Redeemer.

Now, the Scriptures are given to man as a rule in many things, but surely in nothing more than in this very point. We are told that we must build on the foundations of the Scripture. If this, then, be so, surely we cannot expect any superstructure of evidence of God to be enduring, if it be raised on other principles than those which the Scriptures adopt. Concerning this, Pascal says :—

> I marvel at the boldness with which those persons presume to express themselves with respect to the Deity in their addresses to the unbelieving. Their first and great point is to prove a God by the works of nature. Now, I should feel no surprise at this mode of proceeding if their arguments were addressed to believers; for it is certain that those whose hearts are influenced by a lively faith plainly perceive that all things around them are the work of that God whom they adore. As to those, however, in whom this illumination is extinguished, and in whom yet it is wished to revive its guiding fires—persons destitute both of faith and grace—who, making every effort to explore amidst the works of nature something which may direct them to the knowledge of a God, find therein nevertheless nothing but clouds and darkness—to tell such persons that they have but to contemplate the simplest of the objects around them and they will plainly discover in them a Divine hand; to refer them for proofs on this grand and momentous theme to the revolutions of the moon or of the planets, and then to fancy that the sum of the evidences on which their belief is to rest is completed—all this is only calculated to awaken a suspicion that the proofs by which our religion is supported are miserably weak, and instead of impressing reverence for her high revelations, tends rather to bring them into contempt. Therefore it is that I undertake not here to prove from natural causes the existence of God, or the doctrine of the Trinity, or the immortality of the soul, or any other matters of the like kind; not only because I should not think it practicable to find in the works of nature proofs

sufficient to convince the hardened atheist, but because if I were so capable the knowledge thus furnished without a knowledge of Christ would be barren and useless.

For the problems that weigh and press most upon the human heart are not such as can be answered by any study of external nature, even though that nature bore an open testimony. To an enquiring mind the grievous problems of the world are not abstract questions, but those immediate ones which concern human beings—the problems of human misery and human sin. To these nature has no answer; to these she replies only with a silence which is more appalling from its vastness. One vast silence to these awful questions is more than the human heart can endure, so that in the deepest problems of the human heart we turn from nature, for we have applied to her in vain.

And, indeed, the demonstration of the existence and attributes of God from nature is not only contrary to the method of Scripture, but it is in itself connected with a considerable danger. Suppose, for instance, that we follow the method of certain schoolmen, and attempt to demonstrate the existence of God from the fact that there is no vacuum. Now obviously the statement that there is no vacuum is one which is clearly capable of experimental verification, however far off we may be from that verification at present; and there is no one acquainted with the process of science who will venture to maintain that the dogmatic assertion that there is no vacuum can for a moment be accepted without experimental proof. What, then, becomes of the demonstration resting on this assertion? It partakes of the same character of doubt as that assertion on which it is founded. Now, though truth is certainly far mightier than any demonstration of it, yet it is obvious that if the supporters of a truth base their enunciation of it on an argument, which is afterwards proved to be false, the minds of many will thereby be shaken.

I have thought it right to state these views thus explicitly, because we live at present in a transition time of thought; a strong tide has set in of those who look to science not only as not proving, but as actually disproving, the existence of God, and as being opposed to those very attributes which our forefathers attempted to demonstrate from science. And I look upon this as a reaction against the opposite tendency. Whenever an error is committed in one direction it invariably gives rise to a corresponding error in the opposite direction. The undue subjection and oppression of any particular class gives rise to uprising and revolution by that class, and the perpetration, in its turn, of new horrors and oppression. History is full of such instances, and the world continually sways backwards and forwards like a pendulum from one oppression to another, each equally distant on opposite sides of justice.

And as it is in matters political, so it is in matters of the mind, an error on one side leads to an error on the other; and, if an argument be overdrawn in one direction, it is sure, ere long, to be overdrawn in the other direction also. Truth is the only point at which the pendulum of men's thoughts, when once placed, will endeavour to remain.

If, for instance, we insist on shewing God's goodness from natural phenomena, it is possible, also, for those who do not believe in God's goodness to use arguments of a similar kind to prove exactly the reverse. If the sun's rising and setting, and the regular return of harvest, be the proof on which we rest for God's benevolence, then may it not appear to some that hail in harvest may be a proof of equal merit of his malevolence? Indeed, so thoroughly is this so, that the heathen, who have gathered their ideas of God from natural phenomena, as much deprecate the malevolence as praise the benevolence of their deities. Certainly, a mind stored with the love of God will see in these natural phenomena nothing to overturn those sentiments of affection, and will gradually grow to perceive all nature to prove God to be that which revelation describes him to be. But the argument does not go further, and, without revelation these natural arguments are of too low a kind, and may be met with counter-arguments of the same standing. It is only when we proceed to the highest ground that we are on just ground for dealing with these questions.

Yet while we find in the Bible no countenance for the expectation of a direct demonstration of God from His creation, we do, on the other hand, find abundant evidence of the powerful secondary effect which a reference to creation may have; those who believe in Him are continually recalled by the phenomena of nature to a recollection of His qualities, His omnipotence, His unity, His unchangeability.

Bearing these reflections in mind, let us turn briefly to contemplate some of those leading truths of religion upon which science has a direct bearing, and in which its discoveries do, as it appears to me that they do in every case, bear important testimony to the truths of revelation. The direct bearing which the progress of science has on the questions of revelation will then become more apparent. I will refer chiefly, and in order to these three subjects—the unity of God, the fact that man is made in God's image, and the fact of a creation.

We, at the present day, inherit the results of the labour of our ancestors; we live, as it were, among the conclusions of our ancestors; to some extent we all begin where Newton ended. Ideas which were strange *and new to men* long ago have become in our day familiar to our very childhood. Men's thoughts, talk, actions, become all based on the assumption of many things which long ago they required to prove, or, perhaps, even never recognised. Thus the time was when the rotundity of the earth was not even suspected; then it had to be laboriously established and proved; but now the very phraseology in which we speak of the question involves the assumption of its rotundity. The whole flavour of all that goes on about us assumes it, and as a child grows up he finds that it seems to him a natural and almost self-evident idea. There is no doubt that much is lost by this. We never rightly appreciate any piece of knowledge, unless that knowledge has been gained by our own labour; and many of the more important bearings of a phenomenon may be thus entirely lost. We fancy we understand without really understanding. The statement that the earth is round is a bald fact to one of us—to Galileo it implied a long series of considerations, built up into an edifice of which that was the crown. Under these circumstances, it is a useful and most salutary exercise for a person who cannot now place himself in the position in which he is obliged to acquire that idea for himself, to follow, as far he can, the history of its development; to study, if possible, the conditions and circumstances in which men were placed before the idea became familiar; and, above all, to attempt to decipher the various influences which guided men's minds into their present position.

Our very first lispings of the name of God are connected with the idea that there is one God. So imbued are we with this idea by all that we hear and learn, that I suppose, whatever vagaries may ever enter into our heads with respect to God, it never occurs to us to doubt His unity, or to imagine such a thing, for instance, as that the world is governed, or has been created, by twelve intelligent beings. Men, indeed, led away by the sophisms of their own imagination, may doubt that there is an intelligent First Cause of all things; but they never doubt that that cause is One. Placed, then, as we are, it is difficult for us to imagine that mankind were ever differently situated. But there can be no doubt that, however familiar to us now is the idea of the unity of God—however natural and self-evident it may seem—there was a time when it was by no means familiar, natural or self-evident, and when to the mass of mankind it was an idea which had not so much even as occurred.

Look, for instance, at the religion of the Greeks or Romans. These were cultivated nations; men who had reached the highest position in philosophy and in poetry. In their common notions there is not even a trace of this idea. We find a host of beings in whose hands are the control of the elements of nature, and of the fates of men—beings of independent power, and of independent action. They are governed, it is true, by Jupiter; but his power of control is vague and indefinite, and the very foundation of his empire is laid among evil forebodings of other powers, whose former multifarious sway is to return and overwhelm his own. Again, look at our own remote ancestors. The idea of a unity in creation is altogether absent from them. The God of the Sun and the God of the Water vie with one another in their contentions at the Court of Odin. The giants are in continual contest with the gods, and each individual tree has a god of its own. Nor is it only in their notion of the government of the world, but in that of its creation, that we find the same absence of the idea of unity. A strong wind blew from the south upon the frozen regions of the north and melted the frozen vapours into drops, which formed themselves into a cow. Four rivers flowed from its breasts, and it nourished the giant Ymir; and, while it licked the salt rocks with its tongue, it licked them into the shape of a man; and from the blood of the giant Ymir sprung the giants of the ice, those malevolent beings who continually keep binding the world in their frozen bands. A richness of imagery there is undoubtedly here, but there is a multifariousness in it which is far removed from the idea of any underlying unity. The idea of unity, of some underlying unity in all things, is one which has grown in the world. We may trace its rise to many causes, but to none so much as to the progress of a true knowlege of nature.

When day and night seemed capricious phenomena, the reason for whose succession was involved in obscurity, there could be little wonder that those who surveyed them should regard them as the consequences of the labours of contrary and opposing powers. Between day and night everything seems at variance, and the god of the one pursues the god of the other across the sky. But now a patient investigation of nature has led us to know that day and night are merely two different manifestations of the same thing; two effects due precisely to the same cause, the rotation of the earth. How different soever they seem, their cause is one; and unity is thus given to those two phenomena by the progress of science. This is a very simple and elementary instance. Let us now take another instance.

In the ancient mythology of our forefathers, we have the Spirits of Ice, and Snow, and Cloud, who continually attempt to slay the God of the Sun. Sun and Cloud seemed to them utterly opposing phenomena, due to contending divinities. They ascribed them to different influences, because, to them, their effects being different, they seemed to have different causes.

Now, to us, the study of nature has revealed that clouds are due to the sun's heat. The phenomena of a clear and of a cloudy sky have one and the same cause. Again, science has revealed to us a unity in dissimilar things.

Born now, as we are, among these ideas, and bred among them, we are apt to forget how much the patient study of nature has contributed to that idea of the unity of its cause. But science goes still further, and shows an even still more permeating unity in nature.

Let us take two very different phenomena. Why does steam at a high pressure rush out from a vessel containing it? Why does a raindrop glisten with varied colours? Science answers both of these questions. The steam rushes out because of the pressure of that gas. This pressure is caused by the motion of its particles, and the forces which they exercise on one another. The raindrop glistens of various colours, because of the motions of the ether, varied by the forces exercised by the particles of the drop. In both the idea involved in the explanation is the same, that of motion in bodies, regulated by certain forces.

It is not my object here to dwell upon individual cases. These and the like are enough to indicate that the process of science is to reduce all natural phenomena to logical deduction from one permeating principle. All nature is but the manifestation of the same power. All the powers of nature are similar, nay, identical, in their origin and operation; and the natural world becomes more and more presented before us as one concatenated chain of unity.

And here I cannot refrain from remarking the striking testimony thus born by the progress of science to the truth of the Scriptures. In that strange Book, *the Old Testament*, among that strange people, the

Jews, there is continually insisted upon and preserved this idea of the unity of God. Here and there, in the heathen world, individuals, like Socrates, may have reached and grasped that idea; but it is an idea which, as we have seen, the process of long ages was required to develope, where that development has taken place by natural means. But long before science had borne any such testimony, when the world was plunged in darkness with respect to this idea, we find it enunciated and maintained in its full force in that little corner of the earth. Just for a moment compare the Jews with surrounding nations. Their position must have been unintelligible to those nations. They claimed universal sovereignty for their Jehovah; that there was no other God; whereas the nations among whom they lived readily admitted that other gods besides their own might have power. In some religions, indeed, the notion of the unity of God was preserved, but rather as a vague tradition than as a living truth; and the idea seems one which was dying out among mankind, except for the continuous testimony of the Jews, who preserved, as it were, from total extinction, that ray of light which man's corruption since the fall had tended to destroy. In this respect, as in many others, we find the furthest generalisations of the unassisted human intellect anticipated in their full force in the Bible.

It is thus that the gradual progress of natural means, unassisted by revelation, prepares men's minds better for the acceptance of those truths which revelation teaches. The repetition in the Scriptures of the unity of God may seem to us sometimes almost wearisomely unnecessary. Let us never forget that it was an idea which in those days men's circumstances had not yet made it simple for them to grasp. The spiritual truth of the unity of God may indeed have been grasped as thoroughly by them; but it was a greater step for them than for us, and one for which in our case vast preparation has been made by natural science. We thus see in the Scriptures a truth dogmatically taught to those to whom it must have seemed unnatural and difficult, nay, to some extent, unintelligible, and yet which the progress of human knowledge and the results of human enquiry have made easy and natural of acceptance; and it requires no great stretch of imagination to see that this principle may have a wider application, for it illustrates in a tangible and practical manner what may be the meaning of that sentence—'What thou knowest not now, thou shalt know hereafter.' It is in this way of gradually, as it were, educating men's minds, that science seems to have a direct bearing upon the deepest questions of the human heart; and the progress of science seems to me, to put it in one word, to be the progress of the education of the world for the easier acceptance of revelation.

While science has thus been the leading means of diffusing through the world the idea of the unity of all things in the natural world, it has incidentally introduced along with that another change which, in dealing with its influence on the human mind, it would not be proper here to omit. Tacitus says that we look with wonder upon all that we do not understand. Now wonder and admiration are the sources of the highest poetry and art. And there is a mass of glorious imagery about the views of natural objects which were taken by past ages, and which does not belong to the present time. There was no cloud upon the mountain-top which to them did not conceal the conclave of some divinities. The fresh flowers of the morning had risen on the footsteps of some early god. Theirs was a time of the world like the time of childhood; and the world's childhood, like the man's, is full of wonderful imagery of fairy palaces and brave *knights. The fable* of our ancestors was a great ash tree, with its roots in Hell and its branches in Heaven; under its shadow was the home of the gods; its branches were nations, and the wind of the world's bustle was ever rustling among its leaves. You can imagine an untutored nation, living in the depths of the solitude of some forest, fancying that the wind, rustling among the trees, brought them messages from distant countries, which, though unintelligible to them, yet one so wise as a god might read. As it is with the world, so it is with individuals. We do not now go to worship in the temples of Odin, nor do we now ask to be told Chevy-chase for the hundredth time, for the world has advanced in civilisation, and we have advanced in years. It is true that the din of civilisation has deadened our ears to the rustle of the leaves of that tree, and the fairy Paribanou charms us not now as of old. But the religion of our ancestors, though it has degenerated into the fairy lore of the nursery, still has a power great though unseen. We may affect to despise the legends which charmed our youth; yet it is somewhat impious, for the purse of Fortunatus still makes us rich in something other than money, and the shoes of swiftness are not yet worn off our feet. Youth—whether of a nation or a man—is the highland of life; and the clear stream of fancy that issues from the Bandusian fountain of that land, though it be lost to sight, keeps the flatter plain of our after-life fresh and green. Now doubtless we can still enjoy that glorious imagery in which nature was clothed; we read of and admire the chariot of night, with her rime-maned horses flinging from their foaming bridles the dew of morning. Yet these images must have brought to those who first used them a much more personal significance than to us. To them they were realities, to us they are Is not the world of poetry, then, and of reality for ever separated for us? Is it only in a dream-land of the past that our fancy is free? To many this is the result of science, and we even have a poet who complains that science has robbed creation's face of the beauty which he once saw in it. But it is far different. This is far too low a view of what science is—far too low a view of what is unfolded to us by our researches into nature. For science discloses to us the bearings of the innumerable things of the universe upon one another, that infinite concatenation whereby we are led from point to point along the network of nature, which constitutes a more excellent poetry, and the poetry of a more excellent reality; and all the noblest sentiments which give rise to art are called into existence—wonder, awe, and admiration—as there gradually unfolds itself before us the dawnings of that strangely-varied whole, which science teaches us to see in the natural world, teaching us that it is the *same* God who clothes himself with light as with a garment, and who rides upon the wings of the wind. It is as if in those times long ago there had indeed been beautiful notes sounded, more beautiful from the surrounding discord; but in these latter days all these notes have become blended into an harmonious tune—the tune of some master musician, wherein every note is needed for the beauty of the whole. Nay, the imagery which we can now cast about a true and real nature is as infinitely superior to that which was cast about the false, as infinitely more poetical, as the religion of Christ is infinitely more poetical than that of the false deities He has supplanted. We are told that at the survey of creation 'the morning stars sang together, and the sons of God shouted for joy.' These words may seem to be an allegory, but well to convey that it is no unreal imagination, but the contemplation of God's real universe, which gives rise to the highest *ecstasy of poetry* or of art. Let us not, then, mourn over the purple rags of the past, for it is truth only that is poetical:—

> Earth outgrows the mythic fancies
>   Sung beside her in her youth,
> And those debonnaire romances
>   Sound but dull beside the truth.
> Phœbus' chariot course is run,
> Look up, poets, at the sun.

I come now to the second point which I have marked out for our consideration.

In the account of the creation which we find in the first chapter of Genesis, we are told that God made man in His own image. Now man is not the image of God bodily, because we are told that God is a spirit. It must be mentally, then, that man is made in God's image; and, indeed, that seems beautifully signified in part of that same passage, where we are told that God made man's body from the dust, but that Himself breathed into him the breath of life, whereby evidently it is figured that man's soul is borrowed directly from God. Accepting, then, this revelation, we may without irreverence expect to find in the works of God evidence of the operations of an intelligence similar to that of man. Nature seems to present many instances of what we would call excellent engineering, and materials are used in such a way as a skilful engineer would use them; as when we aim at making a better and better machine, we continually find that we are led to imitate the machines of nature. But, inasmuch as I have not time to dwell to any great extent on this question, I will content myself with pointing out a circumstance of this character, which may help to elucidate what is meant by man's intellect being formed in the image of God's.

I will just take one point. One of the peculiar and characteristic points of man's engineering is the advantage which is taken of what otherwise would be an irremediable defect in the machine. This characteristic permeates the whole of human engineering. We find the same characteristic permeating the engineering of nature. I will only take a single instance of each.

One of the irremediable defects of every machine is the friction of its parts. Make the machine ever so good you cannot get rid of this. Engineers, therefore, when they find they cannot get rid of it, take advantage of it; and the friction between the parts of a machine is frequently used as the very means by which the machine is driven. Thus, for instance, it is the friction of the wheels of a locomotive on the rails which is the means by which its power is used for propelling the train. I only take this instance of friction because it is readily apprehended; there are many better examples, for instance, when the oscillating motion of an engine is the very thing which is used for opening and shutting the valves.

I will now take one instance from nature. The air is full of watery vapour. That vapour is so constituted that it intercepts a great part of the sun's heat, and prevents it from reaching us. The sun's heat consists of two parts, luminous and non-luminous heat; it is the non-luminous heat which is intercepted by the watery vapour, the luminous is allowed to pass through. Thus there is what we may call a necessary defect in the atmosphere, inasmuch as watery vapour necessarily must exist there for other reasons. But this defect is turned to account in a way precisely so as to make that defect the very source of the satisfactory result. For the heat which has reached the earth sinks into it, and then becomes non-luminous heat. During the night that heat would leave the earth, being radiated off into space, and would render the earth uninhabitable at night; but the watery vapour prevents its passage outwards by the very same property which we found to be its defect.

Such examples as these have been used by natural philosophers to establish what is called the argument from design, to prove from the beautiful design that there is in nature the existence of an intelligent creator. As I take it, they fall far short of a proof to the unbelieving; for any true scientific process of demonstration consists of a succession or chain of steps, mingling experiment with reasoning, and supplying the gaps in the one by means of the other. If the demonstration is to be complete these links must make an unbroken chain; and it seems to me that there is no demonstration of God which has this complete scientific character, except that by which each individual approaches Him through the awakened need of a Redeemer. The experiments and observations which supply the *lacunæ* of reasoning—just as experiments and observations are required to do in all scientific processes—are here matters of the soul, dealing with spiritual things, into which it is not to the point in this place more particularly to enter. It is far from my intention to deny that the conscience of anyone may be incapable of being awakened by external nature; but in all attempts to reach God through nature alone and through the arguments of natural theology there seems always to occur this flaw in the process, that a part of it depends on an analogy; and an analogy can never form a firm link in that chain of demonstration to which I have alluded. It may convince us certainly, but I am here speaking not of conviction but of demonstration; just as if we should say, 'I believe in God as firmly as I believe that the earth goes round the sun, and by a process just as unanswerable and as scientifically complete, which process, I believe, is furnished to us, and is alone furnished to us, when the scales are removed from the eyes of our sense of faith, and when the light of the Gospel is brought to bear on spiritual phenomena.' These are phenomena which some may deny and which others may disregard, in doing which they act in precisely the same unscientific manner as if I were to shut my eyes to the motions of the planets, and arraign, therefore, as baseless, the fabric of gravitation which is raised on the admission of these motions.

Such instances, however, as I have referred to seem well capable of illustrating and elucidating some of the truths of revelation, and among other things to form an instructive explanation of and commentary on those words of Scripture, that God made man in his own image; and they throw a further light on what that statement signifies, giving it an additional and at any rate a readily-grasped meaning. Do not, however, let my language mislead any one for a moment into thinking that the testimony of nature throws an adequate interpretation upon these words. Man must resemble God surely in far more things than mere intellect. Pity, and love, and justice, and mercy, are qualities of the human mind far higher than any mere intellectual qualities. But as to these qualities I am not at present speaking. Nature with respect to these things is silent. Nature is a servant of revelation, but she is a humble servant, and does not minister in the noblest things.

I pass now to the third point—the testimony of science to a creation.

It has become very customary amongst a certain class of persons to speak of the first chapter of Genesis as if it were a parcel of old wives' fables. Nay, a certain class of men have begun with an unparalleled effrontery to assume that men have, as a whole, ceased entirely to *regard that acco*unt with any shadow of respect. Now, I certainly confess that it would matter little to my hopes of salvation whether the first chapter of Genesis or any other chapter of it were proved true or false. But I must say that I am always struck rather with the general scientific correctness of that account than with any scientific incorrectness.

I know that there are many points in which objections have been taken to that account. Some, especially, seem to fancy that it is necessary for those who maintain the truth of the Scriptures to admit that the world was created in six successive days, that is, intervals between sunrise and sunset. It never seems to me that this is a necessary interpretation of the Mosaic account. But it is obvious that I cannot enter into this question at length here, else I should require to open up questions to which it would be impossible for me to do justice in the short time at my disposal. Let me only just say that while on the one hand the first chapter of Genesis is not a scientific book for scientific people—while on the one hand it was written at a time when the world knew nothing of such things, and was absolutely unprepared for such views—we on the other hand inherit the discoveries and conclusions of our ancestors, we are born and bred amongst a whole series of phrases and thoughts which presuppose the truths which science has demonstrated, which presuppose the order of creation; and when we turn to the Bible we find there dogmatically taught the ideas to which we have only now by natural means attained.

For, let us just take the general order of the Mosaic account of the creation. The order is, that first plants were created, then fishes and birds, then beasts, and lastly man. Now to the correctness of this order of creation (or development if you choose to call it so) science bears the most unwavering testimony. The oldest geological fossils are plants, then there appear fishes and birds, then beasts, and man is evidently of later origin.

Now what has led us to say that this is so? Centuries spent in investigations of all kinds. The scientific proof that this has been the order of creation has been the work of ages, and has only elaborated itself by the increased investigations of modern skill and appliances. It is difficult to suppose that the scientific abilities of men were so far advanced three thousand years ago as to have arrived at this notion by any process of scientific investigation or discovery. Every other testimony is against such a supposition. Every record which comes down to us from such a time is full of monstrous scientific errors and a total confusion of all natural phenomena. Yet here, in this account by Moses of the creation, we find this general character of modern discovery exactly anticipated, nor could there be in a rude and condensed form a better account of the order of geological epochs than that which Moses gives.

It is worth while, I think, just at this point, calling your attention to the fact that there does to a certain extent exist what may be called a direct scientific proof of a creation. It is of a mathematical nature. You may have heard it said that the tendency of the universe is to become of one uniform temperature; that tendency is because of the laws universally observed, that heat is transmitted by conduction from a hotter to a colder body, and in direct proportion to the difference of temperature. If these laws hold good for all time without the intervention of any other law at present unrecognised, the result will be a gradual approach through an infinite future time to a uniform temperature. But we may also apply the same reasoning to going backwards as well as to going forwards; and we *find that just as* we can deduce mathematical formulæ for the distribution of heat in the universe to-morrow from it distribution to-day, so going backwards we can deduce its distribution to-day from its distribution yesterday; or rather I should say we can do this—we can show that as we proceed in time we are able to prove that the condition at any day is logically deducible from the condition of the day before, and is its necessary result, so long as we assume that the laws of heat are the same as now; and assuming these laws we can show that for an infinite future time the state of any day is the necessary consequence of the state of the day that preceded it. But, and here is the point, this is not so for an infinity of past time; for we can show that at some finite time previous to the present there must have necessarily existed a state which could not be the consequence of *any* previous state whatever if the present laws of heat held. Such a state is precisely what we call a creation. There is no flaw in this mathematical demonstration I believe; but I wish just to point out this, that it supposes that we have grasped correctly the laws of the transmission of heat at present. I have already stated these laws, and our ground for believing in them is that the deductions made on their assumption tally with our observations; at the same time it is quite possible that these laws may only be approximate, but so approximate as that no observations or reasonings, except the very ones here used, are capable of shewing their shortcomings.

Still this very statement, while invalidating the direct and positive character of this demonstration, ought to remind us that vast generalisations as to the future or as to the past, founded on our present knowledge of the laws of nature, are precisely the very things which our acquaintance with these laws does not warrant. I put but little weight, therefore, on such a demonstration. I merely bring it before you to show that the weapons which may be used one way may be also used another. The result only should tend still more to convince us of the truth of those remarks with which I set out.

Instances such as I have brought before you, in which the progress of science has borne such wonderful testimony to the dogmatic utterances of revelation, should make those who cling to revealed truth turn with especial satisfaction to the progress of scientific knowledge and investigation; and this they would readily do, I believe, if it were not for the false position which some false advocates of science have assumed. Enemies of revealed truth, they have been accustomed to bring crude scientific theories into opposition with it. I say crude scientific theories, for I think I in no way can be contradicted when I say that not one single thoroughly-established scientific fact or thoroughly-established scientific theory, has ever been found to contradict anything in the Bible, or been found to do anything but add support, such as I have already been indicating, to revelation. We must, however, carefully distinguish between our views of revelation and what revelation really is. There have been many views of revelation which have been proved erroneous; and if science be opposed to such as these so much the better.

For instance, when it was first asserted that the world is moving, this assertion was felt by many persons to be opposed to the truths of revealed religion. It is very hard now to see why. Perhaps it was because in some parts of the Bible it is said that God has set the round world so fast that it cannot be moved. But no sensible person now-a-days regards that statement as in any way interfering with the fact of the earth's rotation. Yet were these persons, who felt this to be *necessary to revelation*, wrong in opposing Galileo and the others who supported what was then the new theory? By no means. They were certainly wrong in persecuting them, but by no means wrong in demanding from them a very rigid proof of their theory before admitting its truth. The new theory ought to be on the defensive, not the religion to which it appears to be opposed. I mention this thus explicitly because I am daily astonished at the effrontery of some so-called advocates of science who, when they have brought forward some crude and half-digested theory which is opposed to something in the Scriptures, call upon those who believe in the Scriptures to overthrow that crude theory or to consider themselves defeated. Let everyone remember that when a theory or a fact has been proved incontestably, it is then time to put religion on its defence; but that, until it be so established, we are not called upon to defend ourselves against objections which are only hypothetical.

I address this remark especially to those, and I believe that there are many, who feel a sort of uneasy disquietude from the frequent statements which are made by the supporters of what is called the development theory. I cannot myself see the point of consequence in which that theory interferes with any of the facts of revelation. If the process of creation has been one of the gradual development of species, I only see in the Mosaic account a testimony wonderfully correct as to the order of that development—a testimony whose general correctness strikes me with equal surprise whether it refer to a continuous evolution or to a series of separate creations; and I am at a loss to decipher which of the two methods of creation brings most prominently and impressively before me the existence of a Creator, and the power and designing forethought manifested in His work. But whether this theory be opposed to the faith of anyone in the Bible or not is little matter, inasmuch as in its present state it is not established either on incontestable, or even nearly incontestable, foundation. If it be ever so established, I do not hesitate to believe that it will then be found that all in it which was contrary to revelation has disappeared, and that all that remains, while perhaps purging away our own false views of revelation, will throw an additional illumination on its immutable truths; and I feel justified in believing this by far the best justification that science affords to any belief, namely, that such has been the case with every other piece of science which has been established. I have blamed men of science for attacking religion by crude theories. I would now blame religious people for too often fearing that attack. They too often tremble when they hear of the progress of some scientific theory or of some daring enquiry into scientific fact. These men of little faith should rather from the past take confidence in the future, remembering that the progress of knowledge is in fact the illumination of revelation, and that it is only in the twilight that these spectres that they fear arise, which, when the full clear light of a completed science shines upon them, hustle away among their kindred errors, and hide their heads for ever in that darkness which is the home of ignorance, faithlessness, and presumption. For these spectres, which menace war between human knowledge and revelation, have got presumption for their father and faithlessness for their nurse.

It is well, in passing, that I should justify the statement which I have made about the theory of development, by stating the grounds on which it is maintained. The theory is that the higher animals have developed from the lower animals through an unbroken series of forms of animal life. Now the ground *of this theory* is, and rightly is, observation. But when we come to enquire whether the observations exist we find that they do not. In one or two instances slight developments or changes have taken place, but on the most limited scale. To establish the theory it requires that an unbroken series of gradually developing fossils should be found. Now we do not find these. There are the most enormous gaps in this series. Supposing that the theory were well established on other grounds by some other series of observations, the existence of these gaps would still be a serious objection to it; but an objection which might be overcome by the supposition that geological or other cataclasms had destroyed intermediate forms; but when the continuous series of fossils forms the only true observational groundwork of the theory, it is an insurmountable objection to it that this continuous series does not exist. The premises of the argument are these—'If a continuous series were to exist the development theory would be probable; but a continuous series does not exist.' Now we may not, I will admit, conclude from these premises that the development theory is false; but we most certainly may not conclude from them that it is true. I am not now arguing, let it be observed, against the development theory. I am only arguing against the present sufficiency of that argument which seems to me necessary for its establishment. Failing the ground which I have here discussed, the other argument in favour of the development theory is that of analogy. Certain developments have taken place, or at any rate appear to have taken place, within narrow limits; and by analogy we may believe that all animals have developed from the lowest organism. Now, the strength of this argument must depend on individual investigation. But I wish to point out this, that an argument from analogy is no proof. It may be the motive cause of our forming a theory, and that theory may be a right one;

but, unless established by proof other than analogy, a theory cannot be regarded as anything more than an hypothesis precisely of that character which Newton disclaimed when he said, ‘hypotheses non fingo.’ I have already indicated what is the proof other than analogy which we require of the development theory, and that proof does not exist. An hypothesis in such a condition as the development hypothesis is one which may be a good working hypothesis, so to speak, but which must be considered as open to very great modifications in the course of its establishment, if eventually established; and any conclusions to which it leads must therefore be regarded as open to the same modifications.

If you put a seed into the ground it dies, and rises again into a new plant. From this, by analogy, some argue to the resurrection of the dead. That is no proof. But it leads many to believe more clearly in the resurrection of the dead. A certain class of men sneer at this result, and express their contempt for those who are guided by such reasoning. Yet that same class of men often are very dogmatic about the development theory, whose basis is also an analogy whose value, as in this case, other evidence must determine.

I wish, however, particularly to call your attention to a fact connected with the modifications which may accrue to such an hypothesis as the development hypothesis; the fact, namely, that two forms of any theory, each accounting apparently equally well for existing data, may be such as to lead to conclusions by no means modifications of one another, but which are absolutely different, and indeed opposite in their character; and I will the more readily do this inasmuch as that while I shall, for the sake of definiteness, apply the remarks which I am about to make more directly to the development hypothesis, it will be easily apparent that *these remarks* are applicable to a great number of those speculations in physical nature to the conclusions of which the indulgence of the present time has sometimes too readily granted the appearance of a firm basis which they do not possess.

Let me take an illustration then. Suppose that a series of waves are running along a canal one after another. If we observe the particles of water which are on the crests of these respective waves, we shall find that every one of them is running forwards in the direction in which the waves themselves are travelling: each particle of water is proceeding into the place about to be vacated by that in front of it, and all are proceeding in the same line. If, then, our observations were confined to a very narrow period of time, it would be no unjust means of correlating these facts to make the hypothesis that these particles were proceeding on a journey in which the furthest back would eventually reach the position then occupied by the furthest forward. But observation of a more extended kind shows us that these particles do not so proceed; but that they each, always continuing to move though not in the same line still in the same relative direction, describe circles confined within very narrow limits about points from which they never far depart. Now I only choose this example to show what is continually the case in our investigations into nature, namely, that too limited an observation leads us very frequently to mistake motion of one character for motion of a totally different character. And if there is anything which has been peculiarly common in the progress of science, it has been the repeated reduction of what seemed at first a motion or development in one direction only, to an oscillation or a multitude of oscillations about some definite point or some determinate character; and the oscillation of species between limits very narrow in proportion to the extremes occupied by the species themselves, seems to me a view not unfit to correlate the facts of development, and capable perhaps of more justification from the history of science than that which supposes one uniform progression. Now it is a principle of mechanics—not of mechanics only, but one of the most universal principles of all material philosophy—that those positions about which oscillations can take place are the positions of stability; nay farther, the possibility of oscillation is the mathematical criterion of stability. I cannot but think therefore that these continual movements of species may just as probably by the process of time become the very arguments by which it is logically proved that these species are stable, as those by which any theory of continuous development may be established. Nor is there wanting the means by which ere long perhaps this very matter may be brought nearer a determination. If you hang a weight to an india-rubber string and let it swing up and down, you will observe that it moves with very varying rapidity, yet these variations have a recognisable harmoniousness in them, especially in becoming slower as they depart more from their mean position; and it is by such considerations that oscillatory movements may be detected. This is no argument, let it be observed, against the present form of the development theory. I have no desire to use arguments against it. I only desire to point out that those who treat it as if it were a matter of fact and not of hypothesis, are opposed to the interests of true science; and that, open as it may be to such radical modifications, it is only in hands animated by an unjust spirit that it can be referred to as overthrowing, or likely to overthrow, any point of religious belief.

Up to this point I have dealt with the influence of what we may call the 'facts' of science on the human mind. But the 'method' of science exercises a wider and more permeating influence, which perhaps may be stronger because less immediately perceptible. Besides the facts which science brings to light, and all the theories which it forms to account for these facts—besides all this, and lying at the root of it all, there is the method which science employs to discover these facts and to make these explanations. There cannot be any doubt that the minds of men during the last few centuries have been more and more influenced by the scientific method. I do not mean that there is any particular method by which all facts have been discovered or theories elaborated; but there is a general character of investigation which is alone successful in science and which teaches a lesson to mankind. Science is continually teaching mankind that no discovery can be made, no subject understood, but by means of personal investigation, personal labour, and personal thought. You may, indeed, understand some natural phenomenon from another person's description or explanation; but if you step forward to investigate it and perform the experiment for yourself, you will invariably find that a new light arises round the subject, and nature itself becomes its own interpreter. Science reads one lesson to all mankind, and it is this—If you will undertake to do something, you will understand about that thing what no dogmatic teaching could ever make you understand.

Such a lesson has an enormous reflex action upon mankind. It seems to me, as I consider it, to be the lesson which science has been sent into the world to teach. It is because the actual studying of science by any individual teaches him that lesson, that I believe it to be a service of God to attempt to diffuse its study; because thereby I believe that mankind are put in a frame of mind better fitted for understanding the true method of Christianity. For the religion which we profess is founded on the same principle as that to which science leads men; it is a religion in which, if we would wish to make truly our own its dogmatic teaching, we must ourselves tread in the footsteps of its founder. And the diffusion of the method of science summons men by action to aim at understanding, and by that very action to culminate their testimony to the religion which they profess.

We stand at present in a great and all-important era of the world's history. There have from time to time come such eras, when old things have been passing away and new things have not yet come. We live in one of those transition periods. There is a certain striking contrast between the end of an old era and the beginning of a new era. The former is favourable to literary development, the latter to practical action. The former is aristocratic, the latter is democratic. I use the words in their widest acceptation. At the end of an old era we find hosts of artificial relationships fulfilled in artificial ways. Relationships, the reason for which has ceased to exist, are yet made tolerable by the punctilious fulfilment of reciprocal duties. And the characteristic of such a time is the fulfilment of duty whose existence is due to circumstances which have continued to exist after their efficient cause is gone. There is a freehandedness about everything—a kind of overplus of mutual fulfilment of conventional duty.

On the contrary, in a new period, relationships have been readjusted to suit new wants and new desires. The relations between men are not those of circumstance, but those of buyer and seller. Duties are demanded of men and fulfilled, but they are now of an altered kind. They are not a gratuitous but a mutual gift; they are something given for value received. The *co-*existence of oppression and magnanimity becomes *no longer tolerable,* and each becomes less common in a democracy—the one less permitted the other less encouraged. And so a new established order of things begins again upon a new basis, until time again changes men's desires, and the duty subsists after the reason for it has gone. Then new changes bring new orders of things, and the cycle is again continued. Each of these periods is one of comparative calm and regularity; but between the two there is a transition period, when old views and systems are being rudely torn up because they have ceased to be realities, and when the whole world surges as under some strange commotion. Men at such times mix memories of the past with shadowy expectations of the future. It is then that the streams run red hot which are to be moulded into the future destiny of mankind. Events succeed one another with startling rapidity, and men are ennobled by the importance of the actions in which they are called upon to share. In such a time the lustre which is shed by the past has not yet died away, while the future is still uncertain. There is a sort of twilight in men's minds at that time—a sort of meeting-point of night and day—which in the mental as in the natural world gives an unwonted magnitude to all things, and throws a grandeur about the most familiar objects. Men who have inherited the contemplative spirit of the past find themselves swept on into action. To be in awful circumstances always lends a certain sublimity to the character, and in such a time men are great with the vague expectation of a new destiny, launching upon an unknown sea ignorant of the future in all save that it must be unlike the past.

At such a time, when the inmost thoughts and convictions of men's hearts are questioned, there are continually found rising those who say, 'Who will show us any good?' There arise those who say, 'Lo here,' and 'Lo there,' and who summon us to seek for truth where truth is not to be found. Amongst those at the present day who are representatives of this class are those who would have us believe that there is no guide to truth and no rule of conduct but the unassisted intellect of man—men who (to alter the words of a modern author) will recognise no phenomena but those of material nature; who, skilled in all the rules of scientific evidence, yet systematically go astray in their appreciation of what is necessary to satisfy the human heart, and of the value of the evidence of a present Providence; and who, because they cannot put man's heart into the laboratory and question it, refuse to listen to its voiceless testimony; so that, whereas in all cases between man and nature their judgment is to be relied on, in all cases between man and man they are blind leaders of the blind. The effect of the teaching of such men is to 'materialise mankind, to lead them to seek for what is expedient without heeding what is just, to attempt to acquire knowledge without faith, and prosperity apart from virtue.'

Against such vagaries as these we must bring that talisman with which God has provided all mankind—the talisman of Faith—that wonderful power which endows man with a new nature, and enables him to perform and endure that, which, without it, it would have been in vain for him to attempt. Such a power is especially needed at such a time as the present, when old things are passing away and a new order not yet begun. Such a faith is that which at terrible crises—crises only recognised fully after they are past—has saved the world again and again. Such faith has been the companion of liberty in all its battles and its triumphs, of liberty both moral and political, 'the cradle of its infancy, the divine source of its claims.' Such faith is the safeguard of morality, and 'morality is the *best security of law*, and the surest pledge of intellectual and political freedom.' Armed with such faith the Pilgrim Fathers, leaving all behind them, founded, although they knew it not, amid the wrecks of the past and the ruins of their own fortune, a sure bulwark of freedom for the future. In the words of their historian, they looked not much on these things, but lifted up their eyes to Heaven, their dearest country, where God hath prepared for them a city, and therein quieted their spirits. Armed with such faith it behoves you to strengthen yourself from all sides by such arguments as we have been dealing with to-day, and then to remember that the sword of faith is not only a defensive but an aggressive weapon, which, unless you use it, will rust in your hands, and you will be guilty of not fighting on the side of God. The result of which apathy is that which too much characterises the present day, when 'the religionists are the enemies of science, and the friends of science attack religion, when the high-minded and the noble advocate intellectual apathy, and the meanest and most servile minds preach independence of thought. The honest and enlightened become opposed to intellectual progress, while men without patriotism and without principles are the apostles of civilisation and of intelligence.' Let the progress of faith and the progress of intelligence go hand in hand and these evils will be avoided. And, though God may have provided for us of the present generation no abiding home here, let us not be dismayed, believing that our faith can provide a better future, and that the future hangs upon that faith; and although these stately and beautiful times of the past be gone, let us not fear but that the year will complete itself into another summer, the seeds of whose flowers our endeavours prepare. And let us remember that in a time like the present we are especially called upon to strengthen our hearts, inasmuch as amidst the contending elements at work the din around us is apt to deaden our ears to external evidence, unless the bulwark of eternal principles be in our hearts—unless there be in our hearts that which is the one safeguard, the one sure helmsman through the dangers and storms and falseness of the world; that strong faith, on the means of whose attainment I have already somewhat touched, in the reality of our relationship to an omnipresent Providence, whereof even Gamaliel was constrained to express one phase when he said, 'If this counsel or this work be of men, it will come to nought; but if it be of God, ye cannot overthrow it.'

The chief weapon of such men as those to whom I have referred, is to draw into strong contrast the results of human knowledge and the doctrines of revealed faith. What such contrast may be worth I leave you now to value for yourselves; having attempted in this lecture to point out that, in whatever direction casual, ephemeral, and crude notions of science may tend, science itself in its thorough establishment is the handmaid of revelation and of religious truth, and raises her testimony to truths which she may be too voiceless to teach.

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